SECTION 43

HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNAL STRUCTURAL SUPPORTS

1.43.1 DESIGN

a. Design shall be in accordance with the current AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals with the following modifications:

Article 1.2.5 - Application of wind load

1.) V = Wind speed 129 kilometers per hour (50 yr. mean recurrence interval).

2.) A design wind velocity greater than 129 kilometers per hour may be applicable in areas where extreme exposure conditions exist. Approval by the Manager, Bureau of Structural Engineering shall be obtained when such conditions are considered to be prevalent.

b. Additional criteria for design are as follows:

1). Luminaire Dead Load: Approximately 36 kilograms each.

2). Maximum projected area: 0.35 square meters per luminaire.

3). The wind drag coefficient (C_d), to be utilized on the luminaires and davits, shall be 1.0.

4). The wind drag coefficient (C_d) to be utilized on the tower shaft shall be 1.2.

5). Gust factor: 1.3

6). Maximum horizontal deflection at the top of the assembled standard with fixtures attached due to a 64 kilometers per hour wind (V) shall not exceed 1.25% of the total shaft height.

c. Fatigue

1.) Subsection 1.9.6 of the current AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals should be referred to for consideration of the fatigue life of support structures.

2.) For aluminum support structures, the guidance in the AASHTO Guide Specifications for Aluminum Highway Bridges should also be followed.

1.43.2 SUPPORT STRUCTURE STANDARDS

a. Steel towers for lighting support structures shall be of the pole type. Material shall be high-strength, low alloy ASTM A588/A588M unpainted, or ASTM A595, Grade C, unpainted.

b. Details of the lighting support structure standards are provided in the NJDOT Electrical Standard Details. Specifications for their installation are provided in Division 700 of the NJDOT Standard Specifications.

c. Section 703 of the NJDOT Standard Specifications should be referred to for requirements regarding proper bolt assembly installation procedures.

d. Payment for the above is scheduled under the item TOWER LIGHTING STANDARD ASSEMBLIES, TYPE _____ under the electrical items of work in the contract.

1.43.3 FOUNDATION

a. The design and plan preparation for the footings of lighting support structures shall be the responsibility of the Designer.

b. The following information for lighting support structures, on an individual contract basis at the time of work request, will be furnished by the Department's Traffic Signal and Safety Engineering Unit.

1). Interchange layout showing location of towers by station and offset.

2). Height of towers and number of luminaires.

3). Design criteria for support structures which will be included in the electrical provisions of the Special Provisions.

4). If other than 75 millimeters above existing (or finished) ground line, elevations of the top of concrete pedestals.

c. The design of the footings shall be in accordance with Section 3 of this Manual.

d. The Structural Design Engineer shall refer to previous construction contracts to review previous borings which may be useful in determining preliminary footing design. Boring log identification numbers for previous construction contracts shall be shown on the contract plans.

e. The proposed subsurface exploration (see Section 36) at each tower lighting location shall be submitted to the Geotechnical Engineering Unit for approval. One deep boring and one or more shallow borings may be required by the Geotechnical Engineer. Continuous sampling, to a reasonable depth, may be necessary and if so will be ordered by the Geotechnical Engineer.
Boring requests shall be directed to the Geotechnical Engineering Unit as soon as possible.

f. The foundations of tower lighting support structures that are located on undisturbed soils shall be designed for an allowable soil pressure that is estimated for a differential settlement that shall not exceed 13 mm. Careful

consideration shall be given to ground water conditions when estimating allowable pressure and settlement of the soil.

Rotation and displacement of a foundation must be restricted to alleviate the possibility of failure of the structure or its having an unsightly visual appearance. Pile foundations shall be used when soil conditions do not readily and reliably indicate the use of spread footings.

The foundation design criteria for tower lighting located on embankment fill shall be established with respect to soil bearing capacity and settlement. Consideration must be given to the stability of the embankment with respect to any possible vertical and/or horizontal movements.

The most important factor to be considered in the foundation design of a lighting support structure is the overturning factor. This will require an adequate provision for passive resistance and upward pull on spread footing and pile foundation design, respectively.

g. Adverse foundation conditions, property lines, subsurface utilities, temporary sheeting, traffic maintenance, and other special conditions which may require individual footing designs shall be investigated by the Structural Design Engineer at each support structure location.

1.43.4 GENERAL

a. Notes on the plans and in the Special Provisions shall require that the contractor submit detail plans and calculations for the support structure shaft, luminaires, and anchor bolt assembly. The Design Unit shall review these drawings to determine that design loads and forces are in accordance with the design assumptions of the footings shown on contract plans.

b. Refer to Section 17 of the NJDOT Procedures Manual for Contract Plan requirements.